

REMARKS

These amendments and remarks attend to all outstanding issues in the Office Action mailed 16 February 2007. Claims 1-8 and 15-22 are pending in the application, with claims 1-7 and 15 considered withdrawn from consideration. Claims 9-14 are presently cancelled.

Claim 8 has been amended to recite "...removing any component of the imaging gradient that encodes motion by oscillating at a regular frequency." Support for this amendment may be found, for example, in the Figures and at paragraph [0006] which discusses traditional MR-based methods where "phase data of each voxel...is accumulated by moving the tissue in synchrony with the motion-encoding gradients" and paragraph [0060] which discusses "removing the motion encoding gradients" from the present pulse sequences and methods.

Newly added claim 16 recites the imaging gradient is a frequency encoding gradient, a phase encoding gradient or a slice selection gradient. Support for this amendment may be found, for example, at paragraphs [0060]-[0062] and in FIGs. 8A, 8B, 9A and 9B.

Claim 17 recites the step of generating the imaging gradient is repeated with the sign of the imaging gradient inverted. Support for this amendment may, for example, be found at paragraphs [0060]-[0062] and in FIGs. 8A, 8B, 9A and 9B.

Claim 18 recites obtaining a first signal and a second signal each containing data indicative of sensed motion, the first signal based on the imaging gradient and the second signal based on the inverted imaging gradient and subtracting phase of the first signal from phase of the second signal to provide a total signal of the sensed motion. See, for example, paragraph [0062].

Claim 19 contains subject matter found in original claim 14.

Claim 20 recites the imaging gradient consists of a positive lobe and a negative lobe. Support for this amendment may be found, for example, in FIGs. 8A, 8B, 9A and 9B.

Claim 21 states that the positive and negative lobes of the imaging gradient have non-symmetric amplitudes. See, for example, FIGs. 8A, 8B, 9A and 9B.

Newly added claim 22 recites an improvement to a magnetic resonance elastography pulse sequence for encoding position and motion of spins in a specimen, the improvement comprising absence of a gradient component that oscillates at a

regular frequency. Support for this amendment may be found, for example, in the Figures and at paragraphs [0006] and [0060], as discussed above.

No new matter has been added to the claims by these amendments.

Election/Restriction

All pending claims are readable upon the subject matter elected for prosecution in the response to the restriction requirement filed August 14, 2006, namely, “systems and methods for encoding motion in a subject”.

Claim Rejections – 35 U.S.C. § 102

Claims 8-14 stand rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,825,186 granted to Ehman (hereinafter “Ehman”).

To anticipate a claim, a reference must teach every element of the claim and “the identical invention must be shown in as complete detail as contained in the... claim.” *MPEP 2131* citing *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 2 USPQ2d 1051 (Fed. Cir. 1987) and *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1913 (Fed. Cir. 1989). Ehman does not teach every element of Applicants’ amended claims.

Ehman discloses a method of producing a stiffness-weighted NMR image by applying an oscillating stress to an object being imaged to generate shear waves. An alternating magnetic field gradient is then applied during detection of the shear waves, with the alternating magnetic field gradient synchronized to the applied stress and “[t]he number of cycles of the alternating magnetic field gradient used in each pulse sequence [dependent upon] the strength of the applied gradient field, the frequency of the synchronous movement to be measured, and the TE time of the pulse sequence.” (col. 11, lines 20-24; abstract; see also col. 3, lines 3-6; and col. 11, lines 20-44). Generally, the alternating magnetic field gradient “...is alternated in polarity to produce five bipolar, gradient waveforms...” (col. 10, lines 3-4).

In contrast to Ehman’s method, Applicants’ independent claims require an ‘removal of any component of the imaging gradient that encodes motion by oscillating at a regular frequency’ (claim 8) and the “absence of a gradient component that oscillates at a regular frequency” (claim 22). Webster’s Online Dictionary defines “regular” as “recurring, attending, or functioning at fixed, uniform, or normal

intervals”. As shown and described in the instant application, traditional motion encoding gradients are removed from the present pulse sequences and imaging gradients are used to simultaneously encode position and motion. The imaging gradients do not oscillate in a fixed and recurring manner over time. Instead, they comprise a single, non-recurring wave having a positive lobe and a negative lobe. Thus Ehman, which discloses that “...the alternating gradient frequency may be [1/1,] 1/3, 1/5, 1/7, 1/9, etc. of the synchronous motion frequency.” (col. 11, lines 42-44), fails to disclose every element of Applicants’ amended independent claims “...in as complete detail as contained in the...claim[s].”

Claims 16-21 depend from claim 1, and benefit from like argument, but further these claims contain additional features that patentably distinguish over Ehman. For example, claim 20 states that the imaging gradient which simultaneously encodes position and motion consists of a positive lobe and a negative lobe. On the other hand, Ehman states that motion encoding gradient 315 “...is alternated in polarity to produce five bipolar, gradient waveforms...” (col. 10, lines 3-4). Claim 21 states the positive and negative lobes of the imaging gradient have non-symmetric amplitudes. Ehman, on the other hand, discusses a single amplitude (e.g., see col. 11, lines 27-35) in relation to the “alternating”, “bipolar” gradient (315, FIG. 3).

In summary, Ehman fails to disclose every element of Applicants’ amended independent claims (or claims dependent thereon), and cannot support a case of anticipation. Withdrawal of the 102 rejection is respectfully requested.

In view of the above Remarks, Applicants have addressed all issues raised in the Office Action dated 16 February 2007. Should any issues remain, the Examiner is encouraged to telephone the undersigned attorney.

Authorization to charge fees associated with a two-month extension of time and one new independent claim is submitted herewith. If any additional fee is deemed necessary in connection with this Response, please charge Deposit Account No. 12-0600.

Respectfully submitted,
LATHROP & GAGE L.C.

Date: July 16, 2007

By: Shireen Marshall
Shireen Marshall, Reg. No. 54,295
4845 Pearl East Circle, Suite 300
Boulder, CO 80301
Tele: (720) 931-3031
Fax: (720) 931-3001